

Having described the invention, what is claimed is:

CLAIM 1.

A process for depositing a film onto a bare or unplated zinc or zinc alloy substrate, the process comprising:

depositing a film onto a portion of the substrate by physical vapor deposition, the film being a metal film, a ceramic film or a combination thereof,

wherein the metal film includes chromium, nickel, titanium, zirconium or a combination thereof, and wherein the ceramic film includes a nitride, a carbide, an oxide or a nitroxide of chromium, nickel, titanium, zirconium, or a combination thereof.

CLAIM 2.

The process of Claim 1 wherein the film is a metal film and the metal film includes chromium, nickel or a combination thereof.

CLAIM 3.

The process of Claim 2 wherein the metal film is deposited at a maximum internal reactor pressure of about 5×10^{-2} torr using a DC voltage ranging from about 25 Volts to about 600 Volts and at deposition rates of about 200 Angstroms to more than 1,000 Angstroms per minute to obtain film thicknesses ranging from about 1000 Angstroms to about 20,000 Angstroms.

CLAIM 4.

The process of Claim 2, wherein the metal film is deposited at a maximum internal reactor pressure of about 5×10^{-2} Torr using a DC voltage ranging from about 40 Volts to about 200 Volts at deposition rates of about 400 Angstroms to more than 500 Angstroms per minute to obtain film thicknesses ranging from about 2,500 Angstroms to about 9,000 Angstroms.

CLAIM 5.

The process of Claim 1 wherein the film is a ceramic film and the ceramic film includes a nitride, a carbide, an oxide or a nitroxide of titanium or zirconium.

CLAIM 6.

The process of Claim 5 wherein the ceramic film is deposited at a maximum internal reactor pressure of about 5×10^{-2} torr using a DC voltage ranging from about 25 Volts to about 600 Volts and at deposition rates of about 200 Angstroms to more than 1,000 Angstroms per minute to obtain film thicknesses ranging from about 1000 Angstroms to about 20,000 Angstroms.

1 **CLAIM 7.**

2 The process of Claim 5, wherein the ceramic film is deposited at a maximum
3 internal reactor pressure of about 5×10^{-2} Torr using a DC voltage ranging from about
4 40 Volts to about 200 Volts at deposition rates of about 400 Angstroms to more than
5 500 Angstroms per minute to obtain film thicknesses ranging from about 2,500 Ang-
6 stroms to about 9,000 Angstrom.

1 **CLAIM 8.**

2 The process of Claim 1 wherein the film is a ceramic film including a nitride, a
3 carbide, an oxide or a nitroxide of titanium.

1 **CLAIM 9.**

2 The process of Claim 1 wherein the film is a ceramic film including a nitride, a
3 carbide, an oxide or a nitroxide of zirconium.

1 **CLAIM 10.**

2 The process of Claim 1 wherein the film is a ceramic film including a nitride, a
3 carbide, an oxide or a nitroxide of both titanium and zirconium.

1 **CLAIM 11.**

2 The process of Claim 1 wherein the film is a ceramic film including a nitride of
3 chromium, nickel, titanium or zirconium.

CLAIM 12

The process of Claim 1 wherein the film is a ceramic film including a carbide of chromium, nickel, titanium or zirconium.

CLAIM 13.

The process of Claim 1 wherein the film is a ceramic film including a nitroxide of chromium, nickel, titanium or zirconium .

CLAIM 14.

The process of Claim 1 wherein the film is a metal film including chromium.

CLAIM 15.

The process of Claim 1 wherein the film is a metal film including nickel.

CLAIM 16.

The process of Claim 1 wherein the ceramic film has a thickness of from about 1,500 Angstroms to about 20,000 Angstroms.

1 **CLAIM 17.**

2 A part comprising

3 a bare or unplated zinc or zinc alloy substrate; and

4 a film deposited directly onto a portion of the substrate by physical vapor
5 deposition, the film being a metal film, a ceramic film or a combination thereof,

6 wherein the metal film includes chromium, nickel, titanium, zirconium or a
7 combination thereof, and wherein the ceramic film includes a nitride, a carbide, an
8 oxide or a nitroxide of chromium, nickel, titanium, zirconium or a combination
9 thereof.

1 **CLAIM 18.**

2 The part of Claim 17 wherein the film is a metal film, and the metal film in-
3 cludes chromium, nickel or a combination thereof.

1 **CLAIM 19.**

2 The part of Claim 17 wherein the film is a ceramic film, and the ceramic film
3 includes a nitride, a carbide, an oxide or a nitroxide of titanium or zirconium.

1 **CLAIM 20.**

2 The part of Claim 19 wherein the ceramic film includes a nitroxide that is a
3 good electrical conductor.

1 **CLAIM 21.**

2 The part of Claim 19 wherein the ceramic film includes a nitroxide that is a
3 poor electrical conductor.

1 **CLAIM 22.**

2 The part of Claim 17 wherein the substrate is bare or unplated zinc.

1 **CLAIM 23.**

2 The part of Claim 17 wherein the substrate is bare or unplated zinc alloy.

1 **CLAIM 24.**

2 The part of Claim 17 wherein the film is a ceramic film and the ceramic film
3 includes a nitride of chromium, nickel, titanium or zirconium.

1 **CLAIM 25.**

2 The part of Claim 17 wherein the film is a ceramic film and the ceramic film
3 includes a carbide of chromium, nickel, titanium or zirconium.

1 **CLAIM 26.**

2 The part of Claim 17 wherein the film is a ceramic film and the ceramic film
3 includes a nitroxide of chromium, nickel, titanium or zirconium.